APPENDIX 8—MONITORING METHODS TO ASSESS WYOMING STANDARDS AND GUIDELINES FOR HEALTHY RANGELANDS

RANGELAND STANDARDS

The 1995 rangeland reform process modified the grazing regulations to address the fundamentals of rangeland health. In August 1997, the *Standards for Healthy Rangelands and Guidelines for Livestock Grazing Management for the Public Lands Administered by the Bureau of Land Management in the State of Wyoming* were approved by the Wyoming State Director. The objectives of the rangeland health regulations are to "promote healthy sustainable rangeland ecosystems; to accelerate restoration and improvement of public rangelands to properly functioning conditions…and to provide for the sustainability of the western livestock industry and communities that are dependent upon productive, healthy public rangelands." The fundamentals of rangeland health combine the basic precepts of physical function and biological health with elements of law relating to water quality and plant and animal populations and communities. Initially, the standards focused on livestock grazing on Bureau of Land Management (BLM)-administered lands, but the standards were developed to apply to all uses and resources.

In the Rawlins Field Office, rangeland standards were assessed on an allotment basis from 1998 through 2000. However, allotment assessments tend to emphasize management and impacts from livestock grazing, rather than all uses that occur on and potentially impact public lands. In addition, assessing watersheds, water quality, and habitat for wildlife, fisheries, and threatened and endangered species often does not correspond to allotment boundaries and is more logically evaluated on a larger scale. In January 2001, Instruction Memorandum (IM) No. 2001-079, Guidance for Conducting Watershed-Based Land Health Assessments, was sent to field offices from the Director of BLM. This IM transmitted the 4180 Manual Section and 4180-1 Rangeland Health Standards Handbook and provides guidance for conducting assessments and evaluations for ascertaining rangeland health on a watershed basis. Under Policy/Action, it states: "The Field Offices are to consider all assessment requirements for the watershed being assessed and select methods which will provide information needed to fulfill those requirements. When a field office invests its resources in an assessment, the end product should substantially meet all assessment needs to avoid conducting multiple assessments for multiple needs. For example, a well-planned, watershed-based assessment can provide the information needed for allotment evaluations, biological assessments for Section 7 Endangered Species Act consultation, and developing habitat management plans, Water Quality Improvement Plans for total maximum daily loads (TMDL) on impaired waters, and watershed restoration actions." In order to complete all Standard Assessments within the original 10-year time frame, watersheds have been divided into seven units, with the upper Colorado River watershed report being the first completed (Map A8-1).

The standards are the basis for assessing and monitoring rangeland conditions and trends. The assessments are conducted by an interdisciplinary team with participation from permittees and other interested parties. Assessments are conducted only on BLM-administered public land; however, interpretation of watershed health and water quality may reflect on all land ownerships within the area of analysis. The following describes and explains the six standards.

Standard 1—Watershed Health

Within the potential of the ecological site (soil type, landform, climate, and geology), soils are stable and allow for water infiltration to provide for optimal plant growth and minimal surface runoff.

This means that—

The hydrologic cycle will be supported by providing for water capture, storage, and sustained release. Adequate energy flow and nutrient cycling through the system will be achieved as optimal plant growth occurs. Plant communities are highly varied within Wyoming.

Indicators may include but are not limited to—

- Water infiltration rates
- Soil compaction
- Erosion (rills, gullies, pedestals, capping)
- Soil micro-organisms
- Vegetative cover (gully bottoms and slopes)
- Bare ground and litter.

These indicators are applied, as appropriate, to the potential of the ecological site. The standard is considered met if upland soil cover generally exceeds 30 percent, obvious signs of soil erosion are not apparent, and stream channels are stable and improving in morphology.

Standard 2—Riparian/Wetland Health

Riparian and wetland vegetation have structural, age, and species diversity characteristic of the state of channel succession and is resilient and capable of recovering from natural and human disturbance in order to provide forage and cover, capture sediment, dissipate energy, and provide for groundwater recharge.

This means that—

Wyoming has highly varied riparian and wetland systems on public lands. These systems vary from large rivers to small streams and from springs to large wet meadows. These systems are in various stages of natural cycles and may also reflect other disturbance that is either localized or widespread throughout the watershed. Riparian vegetation captures sediments and associated materials, thus enhancing the nutrient cycle by capturing and using nutrients that would otherwise move through a system unused.

Indicators may include but are not limited to—

- Erosion and deposition rate
- Channel morphology and flood plain function
- Channel succession and erosion cycle
- Vegetative cover
- Plant composition and diversity (species, age class, structure, successional stages, desired plant community, etc.)
- Bank stability
- Woody debris and instream cover
- Bare ground and litter.

These indicators are applied, as appropriate, to the potential of the ecological site. The standard is considered met if riparian/wetland habitat is rated in proper functioning condition (PFC), and existing management will lead to maintaining or improving resource conditions.

Standard 3—Upland Vegetation Health

Upland vegetation on each ecological site consists of plant communities appropriate to the site, which are resilient, diverse, and able to recover from natural and human disturbance.

This means that—

To maintain desirable conditions and/or recover from disturbance within acceptable time frames, plant communities must have the components present to support the nutrient cycle and adequate energy flow. Plants depend on nutrients in the soil and energy derived from sunlight. Nutrients stored in the soil are used over and over by plants, animals, and micro-organisms. The amount of nutrients available and the speed with which they cycle among plants, animals, and the soil are fundamental components of rangeland health. The amount, timing, and distribution of energy captured through photosynthesis are fundamental to the function of rangeland ecosystems.

Indicators may include, but are not limited to—

- Vegetative cover
- Plant composition and diversity (species, age class, structure, successional stages, desired plant community, etc.)
- Bare ground and litter
- Erosion (rills, gullies, pedestals, capping)
- Water infiltration rates.

These indicators are applied, as appropriate, to the potential of the ecological site. The standard is considered met if plant communities are sustaining themselves under existing conditions and management.

Standard 4—Wildlife/Threatened and Endangered Species Habitat Health, Fisheries, and Weeds

Rangelands are capable of sustaining viable populations and a diversity of native plant and animal species appropriate to the habitat. Habitats that support or could support threatened species, endangered species, species of special concern, or sensitive species will be maintained or enhanced.

This means that—

The management of Wyoming rangelands will achieve or maintain adequate habitat conditions that support diverse plant and animal species. These may include listed threatened or endangered species (U.S. Fish and Wildlife-designated), species of special concern (BLM-designated), and other sensitive species (State of Wyoming-designated). The intent of this standard is to allow the listed species to recover and be delisted, and to avoid or prevent additional species becoming listed.

Indicators may include, but are not limited to—

- Noxious weeds
- Species diversity

- Age class distribution
- All indicators associated with the upland and riparian standards
- Population trends
- Habitat fragmentation.

The above indicators are applied as appropriate to the potential of the ecological site. The standard is considered met if habitat needed to support wildlife species is being sustained under existing conditions and management.

Standard 5—Water Quality

Water quality meets Wyoming standards.

This means that—

The State of Wyoming is authorized to administer the Clean Water Act. BLM management actions or use authorizations will comply with all federal and state water quality laws, rules, and regulations to address water quality issues that originate on public lands. Provisions for the establishment of water quality standards are included in the Clean Water Act, as amended, and the Wyoming Environmental Quality Act, as amended. Regulations are found in Part 40 of the Code of Federal Regulations and in Wyoming's Water Quality Rules and Regulations. The latter regulations contain Quality Standards for Wyoming Surface Waters. Natural processes and human actions influence the chemical, physical, and biological characteristics of water. Water quality varies from place to place with the seasons, the climate, and the kinds of substrate through which water moves. Therefore, the assessment of water quality takes these factors into account.

Indicators may include but are not limited to—

- Chemical characteristics (e.g., pH, conductivity, dissolved oxygen)
- Physical characteristics (e.g., sediment, temperature, color)
- Biological characteristics (e.g., macro- and microinvertebrates, fecal coliform, and plant and animal species).

The standard is considered unknown unless information provided by the State of Wyoming determines the status of a water body as impaired (not meeting) or is meeting its beneficial uses.

Standard 6—Air Quality

Air quality meets Wyoming standards.

This means that—

The State of Wyoming is authorized to administer the Clean Air Act (CAA). BLM management actions or use authorizations will comply with all federal and state air quality laws, rules, regulations and standards. Provisions for the establishment of air quality standards are included in the CAA, as amended, and the Wyoming Environmental Quality Act, as amended. Regulations are found in Part 40 of the Code of Federal Regulations and in Wyoming Air Quality Standards and Regulations.

The standard is considered met or impaired based on information provided by the State of Wyoming.

Implementation

If an assessment shows that a standard(s) is not being met, factors contributing to the nonattainment are identified and management recommendations developed so the standard may be attained. If livestock are contributing to the nonattainment of a standard, as soon as practical, but no later than the start of the next grazing season, management practices (guidelines) must be implemented to ensure that progress is being made toward attainment of the standard(s).

Guidelines consist of a number of alternatives, one or more of which may be implemented in an effort to bring an allotment into conformance with a specific standard.

I. Timing, duration, and levels of authorized grazing will ensure that adequate amounts of vegetative ground cover, including standing plant material and litter, remain after authorized use to support infiltration, maintain soil moisture storage, stabilize soils, allow the release of sufficient water to maintain system function, and to maintain subsurface soil conditions that support permeability rates and other processes appropriate to the site.

II. Grazing management practices should restore, maintain, or improve riparian plant communities. Grazing management strategies consider hydrology, physical attributes, and potential for the watershed and the ecological site. Grazing management should maintain adequate residual plant cover to provide for plant recovery, residual forage, sediment capture, energy dissipation, and groundwater recharge.

III. Range improvement practices (instream structures, fences, water troughs, etc.) in and adjacent to riparian areas will ensure that stream channel morphology (e.g., gradient, width/depth ratio, channel roughness and sinuosity) and functions appropriate to climate and landform are maintained or enhanced. The development of springs, seeps, or other projects affecting water and associated resources shall be designed to protect the ecological and hydrological functions, wildlife habitat, and significant cultural, historical, and archeological values associated with the water source. Range improvements will be located away from riparian areas if they conflict with achieving or maintaining riparian function.

IV. Grazing practices that consider the biotic communities as more than just a forage base will be designed in order to ensure that the appropriate kinds and amounts of soil organisms, plants, and animals to support the hydrologic cycle, nutrient cycle, and energy flow are maintained or enhanced.

V. Continuous season-long or other grazing management practices that hinder the completion of plants' life-sustaining reproductive and/or nutrient cycling processes will be modified to ensure adequate periods of rest at the appropriate times. The rest periods will provide for seedling establishment or other necessary processes at levels sufficient to move the ecological site condition toward the resource objective and subsequent achievement of the standard.

VI. Grazing management practices and range improvements will adequately protect vegetative cover and physical conditions and maintain, restore, or enhance water quality to meet resource objectives. The effects of new range improvements (water developments, fences, etc.) on the health and function of rangelands will be carefully considered prior to their implementation.

VII. Grazing management practices will incorporate the kinds and amounts of use that will restore, maintain, or enhance habitats to assist in the recovery of federal threatened and endangered species or the conservation of federally-listed species of concern and other state-designated

Special Status Species. Grazing management practices will maintain existing habitat or facilitate vegetation change toward desired habitats. Grazing management will consider threatened and endangered species and their habitats.

VIII. Grazing management practices and range improvements will be designed to maintain or promote the physical and biological conditions necessary to sustain native animal populations and plant communities. This will involve emphasizing native plant species in the support of ecological function and incorporating the use of non-native species only in those situations in which native plant species are not available in sufficient quantities or are incapable of maintaining or achieving properly functioning conditions and biological health.

IX. Grazing management practices on uplands will maintain desired plant communities or facilitate change toward desired plant communities.

The rangeland standards establish a threshold that should be achievable within 3–5 years, in contrast to the DPC, which would usually be at a higher level than the threshold and take longer to achieve. The DPC portrays the land or resource values that would exist in the future if management goals were achieved. The length of time to achieve the DPC would vary depending on the resources involved, the management actions required, and the speed at which different resources can effectively change. For instance, improving plant cover and litter, or changing species composition with treatments, may be achieved relatively quickly (5–10 years). However, developing a mixed age structure of willows along a stream by changing livestock management may take 20–30 years, even though the area it may be properly functioning. Other actions, such as restoring aspen woodland within lodgepole pine forest communities using prescribed or natural fire, may take 50 years or more.

Watershed-Based Assessment Reports

The framework for the watershed-based assessment and report follows the "Ecosystem Analysis at the Watershed Scale: Federal Guide for Watershed Analysis—Version 2.2." The format contains an introduction and background information, followed by discussion of each rangeland standard in the order described earlier in this document. Within the discussion for each standard is a map and description of how the standard is addressed. The outline of discussion for each standard follows the six-step process for ecosystem analysis at the watershed scale. The six steps are (1) characterization of the watershed, (2) identification of issues and key questions, (3) description of current conditions, (4) description of reference conditions, (5) synthesis and interpretation of information, and (6) recommendations. Core topics are discussed under the appropriate standard, with erosion processes, hydrology, and stream channels under Standard 1; vegetation split into wetland/riparian or upland under Standards 2 and 3; species and habitats under Standard 4; and water quality under Standard 5. Human uses are discussed under each standard where appropriate.

Watershed-based assessments and reports are expected to have long-lasting results. Based on communication and coordination with permittees, local government, and affected interests, these reports provide historical perspective and a point-in-time analysis of the "big picture." These reports will be useful to look back on when future assessments in the same area are completed. They also identify problems that require correction or improvement that result from not only grazing, but other sources that impact public lands that in the past were often not addressed. Areas of concern or management issues identified in these reports will help identify future priorities for budget requests, project planning, and monitoring.

MONITORING

Monitoring is the collection of data along with professional observations used in evaluating rangeland health to determine whether standards are being met. Common elements of monitoring include climate information, animal numbers and use periods, animal diet and/or plant use data, and trends (changes over time) in other important values. These may be related to plant health, watershed cover, stream channel shape, water flow and quality, macroinvertebrates, insects, wildlife populations, etc. One-time evaluations, such as assessment of the proper functioning condition of riparian habitat, are not considered monitoring. The following descriptions further explain some of the types of data commonly collected and used in the evaluation process:

- **Rain Gages:** Climate data primarily consist of precipitation information from the National Weather Service and BLM stations around the RMPPA. These allow analysis of the amount and timing of moisture compared with water availability and forage production observed in the field.

- **Animal Numbers and Use Periods:** Animal numbers are obtained from permittees for livestock, from the WGFD for big game herd units, and from BLM counts for wild horses. Use periods and/or distribution of use are determined from a combination of permittee information and field observations for livestock, and primarily from field observations for big game, other wildlife use, and wild horses.

- **Animal Diet/Plant Utilization:** This information is used to determine what types and quantities of plants are being eaten, as well as the changes in selection through different seasons. Animal diet is usually obtained by fecal analysis or field observations, while plant utilization is always measured or observed through field visits.

- **Upland Cover:** This information refers either to soil cover or vegetation cover, or both. It is determined by reading transects and/or plots. Soil cover information usually includes plant cover, litter, fecal matter, cryptograms, rocks, and bare ground. Plant species composition, plant spacing, or other data may also be collected. Vegetation cover information is often data about plants and may include cover, density, height, and, for shrubs and trees, age and hedge class information, all usually by individual plant species. This information is used to evaluate what the upland range condition is and whether the proper plant species are able to sustain healthy range condition.

- **Riparian Cross-Sections:** This information is used to record changes in the channel geometry and the riparian stability. Cross-sections of riparian areas are surveyed with a surveying level and rod to assess changes in channel shape. These monitoring techniques are designed to assess changes in stream channel width and depth, side channel modifications, sloughing of banks, and other changes in the riparian micro-topography.

- **Photo Points:** Photo points are usually permanent points, marked with steel posts, angle irons, or rock piles, where photographs are retaken to show change in vegetation, stream channels, or some other landscape features. There are between 2,000–3,000 such points, located in grasslands, shrublands, riparian, aspen, and juniper range types. Depending on the management objectives and priority, they are revisited every 2–10 years. They are often found in association with other monitoring studies.

- **Riparian Monitoring:** Methods such as green line surveys or other quantitative vegetation-related methods may be used to determine current riparian conditions and assess effectiveness of management changes along with riparian cross-sections and photo points.

- **Monitoring Wells:** To assess the depth to saturation in the soil of riparian areas, the range staff has established shallow monitoring wells (peizometers) at different riparian areas in the RMPPA. These help to determine the effects of grazing animals on soil compaction, porosity, and permeability, and whether water is within the rooting zone of riparian plants. There are approximately 20 monitoring wells in the RMPPA, which are read every 2–3 years.

- **Stream Gaging Stations:** Stream gages are operated and maintained on larger drainages by the U.S. Geological Survey on a permanent basis. Other entities, like the BLM, conservation districts, and the University of Wyoming will alone or cooperatively set up stream gages on smaller drainages for special projects to collect more information or monitor changes in management. Gages are currently in place along Muddy Creek and Sage Creek for this purpose. This usually involves documentation of amount and timing of flows, and may include various qualitative parameters such as turbidity, pH, dissolved oxygen, and sediment load.

- **Wildlife Species Activity and Counts:** Special Status Species, such as greater sage-grouse and mountain plover, may have more attention focused upon them. Use areas, number of birds, and concentration areas are documented and used in future management decisions. In some cases it may be a unique or important habitat (i.e., riparian). In the George Dew and Red Wash areas along Muddy Creek, the species and timing of birds using the improved or created wetland/riparian habitat is being documented to show the benefits of such activities, as well as any possible adverse impacts to native fish.

- **Macroinvertebrates:** The State of Wyoming (Wyoming Department of Environmental Quality) has developed a protocol for water quality assessments that includes monitoring of macroinvertebrates. Local conservation districts help to collect this information as a tool to define priority areas for work and to monitor results. This often includes public lands as well as private and state lands, with data gathered shared with the affected interests. This is much less expensive and may show results faster than simply using more stream gaging stations.